If I were a plant pathologist I would be in heaven with the amount of disease I have seen on stone fruit, apples and pears. The rains are keeping everyone on their toes, or, on their sprayers trying to maintain coverage. Remember that ~2 inches of rain is needed to wash off the materials. In high disease pressure blocks you may not want to give it a full 2 inches before you re-apply.

**Brown Rot:** The 3 weeks prior to harvest are a critical time for controlling brown rot on your stone fruit caused by *Monilinia fructicola*. The wet, humid, very warm weather we have been having is ideal for infections, which can take only a few hours to occur, particularly if there is inoculum present in the tree. Maintain fungicide coverage through harvest.

Don’t make the mistake of thinking this disease is controlled because you are not seeing symptoms on the fruit at harvest – infections can show up in storage if infected fruit in the bin goes undetected.

Materials with good to excellent efficacy should be used in rotation and include: Indar, Quash, Rally or Tilt (FRAC 3), Captan (FRAC M4), Fontelis (FRAC 7), Elevate (FRAC 17) or Pristine, Luna Sensation, or Merivon (FRAC 7 & 11).

**Bacterial Spot** is showing up on fruit which should not be a surprise considering the amount of leaf infections around the state this year. Maintain coverage using Mycoshield or Fireline (FRAC 41: PHI 21 days), Double Nickel or Serenade Optimum (Biologicals, FRAC NC: PHI 0 days). Copper materials are labeled for summer use against bacterial spot. Care should be taken, particularly in this hot weather, understanding that damage can occur under slow drying conditions.

**Sooty Blotch & Fly Speck** fungicide coverage must be maintained until harvest even if we happen to head into a dry spell. Spray intervals should not exceed 14 days during this wet weather and if we have 2 inches of rain before the 14 days are up you should re-apply.
New Considerations for Controlling Bitter Rot on Apples
Dave Rosenberger, Highland, NY   Published 10 July 2017 in Scaffolds Fruit Journal

Bitter rot, which can be caused by at least 18 different species of *Colletotrichum* worldwide, continues to be one of the more difficult summer diseases to control on some apple cultivars. Bitter rot is an especially severe problem on Honeycrisp and some of the other early-maturing cultivars. An update on what we know about the pathogens causing bitter rot was posted on my blog back in January (See http://blogs.cornell.edu/plantpathhvl/2017/01/20/recent-changes-in-our-understanding-of-bitter-rot-of-apples/). Based on available evidence, it appears that bitter rot in Northeastern United States and probably in much of the Midwest is caused primarily by *Colletotrichum fioriniae*, a species within the broader *C. acutatum* group. South of the Mason Dixon line, bitter rot may be caused by species that include representatives from the *C. gloeosporioides* group that have different fungicide sensitivities and a somewhat different life cycle. The rest of this article pertains primarily to controlling bitter rot in the northeast and Midwest where *C. fioriniae* seems to be the predominant pathogen on apples.

In previous commentary, fungicides recommended for control of bitter rot in the Northeast included captan, ziram, and QoI fungicides such as trifloxystrobin (i.e., as Flint or as one component in Luna Sensation) or pyraclostrobin (which is present in both Pristine and Merivon). It is becoming evident, however, that continued dependence on QoI fungicides for controlling bitter rot in apples is probably neither sustainable nor advisable.

Over the past few years, numerous scientists have been reporting that *Colletotrichum* species are developing resistance to QoI fungicides. Resistant isolates have been recovered from apples (Koenig et al. 2012, Kim et al. 2016, Munir et al. 2016) and other fruit crops around the world (Forcelini et al. 2016, Nita and Bly2016). Because QoI fungicides applied to apples during summer are always recommended in combinations with captan (or perhaps Ziram), one might argue that the mixtures with these multi-site inhibitor fungicides should suffice as an anti-resistance strategy. However, mixtures with captan alone may not be effective for preventing development of QoI-resistant bitter rot due to the unique capabilities of *Colletotrichum* species within the *C. acutatum* group.

Researchers in both Norway (Børve and Stensvand 2007, 2016) and New Zealand (Everett et al. 2010) have shown that several species within the *C. acutatum* group can overwinter in bud scales (as well as in rotted fruit and dead twigs) and then can move into leaves during summer without causing any disease symptoms on these leaves. (Glomerella leaf spot, it now appears, is caused primarily by species in the *C. gloeosporioides* group.) It is not clear if the symptomless leaves that are inhabited by *C. acutatum* species play a significant role in producing inoculum for subsequent fruit infections, but Colletotrichum present in leaves may play a role in fungicide resistance development. The best evidence to date suggests that inoculum is probably coming from mummified fruit from previous years that survive on the orchard floor, thinned fruit that were dropped to the ground during early summer, and/or infected prunings that are left beneath
trees (Everett et al. 2010). However, if *Colletotrichum* moves into apple leaves during summer, then the fungus present in leaves may get repeated doses of QoI fungicides (every time the orchard is sprayed with a QoI/captan mixture), but it will not be exposed to captan because the QoI fungicide can move into leaves but the captan cannot. It is important to note that I do NOT know for certain if this is occurring, but it seems possible based on the existing literature.

Fortunately, we may have at least a partial solution for improving resistance management strategies for *Colletotrichum* species in apples. Recent work by Yoder et al. (2016) and Ishii et al. (2016) have shown that two of the new SDHI fungicides, Fontelis and Aprovia, have reasonably good activity against pathogens in the *C. acutatum* group. (Ishii’s group also showed that the SDHI components in *Luna Sensation*, *Merivon*, and *Pristine* are NOT effective against *C. acutatum*, so using one of those fungicides against bitter rot has the same effect as applying a QoI alone.) Fontelis and Aprovia have been promoted primarily for controlling early-season diseases, but including one or two sprays of either of these products, mixed with Captan or other fungicides, during July or early August might help to slow development of QoI-resistant *Colletotrichum* species in apple orchards. Neither Fontelis nor Aprovia can be applied during the last month before harvest, so the window for using them would be in mid-summer when bitter rot begins to build up in leaves and forms quiescent infections on fruit. QoI-containing fungicides could then be used in mixtures with captan for sprays closer to harvest, thereby providing a rotation of products that are absorbed into leaves and protect fruit.

Bitter rot suppression is listed on the Aprovia label. Fontelis is not labeled for bitter rot, although it can be applied during summer to control apple scab. Only limited quantities of Aprovia and Fontelis can be applied each year (three or four applications, depending on rates used), so growers who used these products in multiple early-season sprays may not be eligible to apply them during summer this year.

It is important to note that while Aprovia plus captan at the rates tested by Yoder’s group provided excellent control of sooty blotch and flyspeck (SBFS) in addition to controlling fruit rots, Fontelis plus captan did not provide adequate control of flyspeck. Thus, to protect against the full range of summer diseases (SBFS and fruit rots), growers who opt to use Fontelis in summer sprays may need to increase the rate of captan-80 in the Fontelis/captan mixture from 3 lb/A as used by Yoder to 4 or 5 lb/A. Or they may need to include a third fungicide in the tank mixture (e.g., a phosphite or Topsin M, if the latter is allowed by the sales group who will be handling the fruit). Since I have no first-hand experience in using a Fontelis/captan/phosphite tank mix, this option should be approached with caution. Fontelis/captan mixtures have caused some leaf injury when applied to lush foliage right after bloom, but it seems unlikely that Fontelis plus captan alone will cause problems when applied during summer. Yoder reported no phytotoxicity issues with either the Fontelis/captan or the Fontelis/Prophyt mixtures, but the three-way mix remains untested so far as I know.

In conclusion, the concept of using alternations of SDHI and QoI fungicides in tank mixes with captan to slow selection pressure for resistance in *Colletotrichum* species in apple orchards seems logical based on the published literature, but the effectiveness of this approach remains
unproven, both as it relates to season-long control of bitter rot and as it relates to resistance management. I have presented the concept here primarily because I am concerned that QoI-resistant bitter rot may predominate in orchards before the concept can be fully field-tested, and alternative strategies may need to be implemented as soon as possible.

Literature cited:
• Koenig, S. M., Sundin, G. W., and Beckerman, J. L. 2012. Factors involved in Indiana bitter rot outbreaks. Phytopathology 102(Suppl.5):S5.6

Apple Maggot is expected any time now with all the rain we have had. Place AM traps along the edge of blocks near woods – they migrate into the block. The threshold for unbaited traps is 1 and the threshold for baited traps is 5. Management options include Actara, Assail and Belay (IRAC 4A), Imidan (IRAC 1B), Avaunt (IRAC 22), Exirel (IRAC 28) and Endigo (IRAC 4A/3A). Surround is a repellent and must be applied prior to AM emergence, then reapplied every 10-14 days.

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